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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/509,881	10/04/2004	Yafei Zhang	SHA 131NP	2883
23995	7590	04/17/2008	EXAMINER	
RABIN & Berdo, PC 1101 14TH STREET, NW SUITE 500 WASHINGTON, DC 20005			ROLLAND, ALEX A	
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			4172	
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/509,881	<b>Applicant(s)</b> ZHANG ET AL.	
	<b>Examiner</b> ALEX ROLLAND	<b>Art Unit</b> 4172	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 10/04/2004.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☒ Claim(s) 1, 4, 6, 8-11 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |



## **DETAILED ACTION**

### ***Specification***

1. The disclosure is objected to because of the following informalities:

35 U.S.C. 112, first paragraph, requires the specification to be written in "full, clear, concise, and exact terms." The specification is replete with terms which are not clear, concise and exact. The specification should be revised carefully in order to comply with 35 U.S.C. 112, first paragraph. Examples of some unclear, inexact or verbose terms used in the specification are: "compressed continuously at a speed of 20-50 mN/m", "sulfated (nitridized)", "organic macromolecular", etc.

Appropriate correction is required.

### ***Claim Objections***

2. Claims 1, 4, 6, 8-11 objected to because of the following informalities: organic macromolecule is misspelled as "organic macromolecular". Appropriate correction is required.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. The term "routinely" in claim 1 is a relative term which renders the claim indefinite. The term "routinely" is not defined by the claim, the specification does not

provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. Appropriate correction is required.

4. Claim 4 recites “sulfated/nitridized” is not clear. The term “/” is a relative term which renders the claim indefinite. The term “/” is not defined by the claim, it is not clear “/” means “and” or “or”, One of ordinary skill in the art would not be reasonably apprised of the scope of the invention. One would not know what the metes and bounds of the claim is.

### ***Claim Rejections - 35 USC § 102***

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claim1 is rejected under 35 U.S.C. 102(b) as being anticipated by Hickel et al (US 5,580,612).

Claim 1 is drawn to a method of arranging carbon nanotubes on a substrate wherein:

substrate is treated to be hydrophilic or hydrophobic;

organic molecule with hydrophilic and hydrophobic end is attached to the surface of every carbon nanotube and then dissolved into water or an organic solvent;

solution is spread onto the surface of water, the water or organic solvent is evaporated, and pressure is applied in accordance with the surface pressure-area isotherm; and

film is transferred to substrate.

Hickel et al teaches a method of arranging fullerenes on a substrate wherein:

a hydrophobic or hydrophilic substrate (col. 2, lines 40-46);

fullerene and amphiphilic polymers dissolved in a volatile organic solvent (col. 2, line 7 and col. 3, lines 35-50)

solution is spread on the water surface, the organic solvent is vaporized, whereby a film remains on the water surface, the film is compressed (col. 3, lines 35-50); and

transferred onto the solid base (col. 3, lines 35-50).

Hickel et al does not explicitly state that pressure is applied by controlling the surface pressure-area isotherm. However, such a feature is believed to be inherent as Hickel et al discloses a surface pressure-area isotherm that is substantially identical the surface pressure-area isotherm in the present application (See Figure 1).

The claimed invention is found to be anticipated because Hickel et al teaches every aspect of the claimed invention

***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

9. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

10. Claims 2-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hickel et al (US 5,580,612) in view of Ligenza (US 2,930,722).

Hickel et al is discussed above and does disclose hydrophobic treatment using silanes on a hydrophilic substrate (col. 3, lines 7-10), but fails to disclose a specific hydrophilic treatment.

However, Ligenza teaches a method of hydrophilic treatment used in the treatment of silicon. This treatment involves immersion of silicon substrate into concentrated nitric acid at a temperature of about 100°C in order to make said substrate almost perfectly hydrophilic. See col. 2, lines 65-70 and col. 3, lines 5-12.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to utilize the well-known method disclosed in Ligenza in order to make hydrophilic a substrate for use in the process disclosed in Hickel et al.

11. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hickel et al (US 5,580,612) in view of Fujimaki et al (US 4,009,305).

Hickel et al is discussed above but does not disclose a specific method for attaching an organic macromolecule.

However, Fujimaki et al teaches a method of oxidizing carbon fibre wherein:

nitric acid is utilized to form oxygen-containing functional groups such as carboxyl groups (col. 2, lines 40-60);

the functional groups on the surface of the carbon fibre are reacted with an organic amine (col. 2, lines 60-65); and



the resulting carbon fibre has an affinity for most synthetic resins (col. 4, lines 3-5).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Hickel et al to include oxidation followed by reaction with an amine as suggested by Fujimaki with a reasonable expectation of success since Hickel et al teaches a mixture of fullerene and organic polymeric amphiphilic compound and Fujimaki teaches that oxidation followed by reaction with an amine increases carbon fibre's affinity towards synthetic resin (an organic polymer that may be amphiphilic).

12. Claim 5 is rejected under 35 U.S.C. 103(a) as obvious over Hickel et al (US 5,580,612).

Hickel et al is discussed above but does not specifically state the pressure in which the fullerene film is compressed.

However, usage of pressure between 20-50 mN/m would have been obvious to one of ordinary skill in the art at the time of the invention to choose through process optimization, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. See In re Boesch, 205 USPQ 215 (CCPA 1980).

13. Claims 6-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hickel et al (US 5,580,612) in view of Uekita et al (US 5,043,248).

Hickel et al is discussed above but does not specifically disclose a method for decomposing and evaporating amphiphilic organic macromolecule or the type of light irradiation used.

However, Uekita et al teaches photosensitive amphiphilic organic polymers useful in the Langmuir-Blodgett technique that have a structure of causing decomposition by ultraviolet rays. See col. 2, lines 1-15, generally.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Hickel et al to include ultraviolet radiation to aid in the removal of amphiphilic organic polymers as suggested by Uekita et al with a reasonable expectation of success since Hickel et al teaches the Langmuir-Blodgett technique applied to fullerenes using amphiphilic organic molecules and Uekita et al teaches that ultraviolet radiation aids in the removal of amphiphilic organic molecules after the Langmuir-Blodgett technique is preformed.

#### Conclusion

14. No Claims are allowed. All pending claims are rejected for the reasons set forth above.

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to ALEX ROLLAND whose telephone number is (571)270-5355. The examiner can normally be reached on Monday through Friday, 7:30 a.m. to 5:00 p.m. EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vickie Kim can be reached on (571)272-0579. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/ALEX ROLLAND/  
Examiner, Art Unit 4172

/Vickie Kim/  
Supervisory Patent Examiner, Art Unit 4172